



Market Data Feed Specification (Binary Version)

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System response times may vary for a number of reasons including market conditions, trading volumes and system performance.

VERSION HISTORY

VERSION	DESCRIPTION	DATE
6.5p1	First Release	28-05-2021
6.5p2	Cboe rebranding	01-02-2022

1 Introduction

Cboe Australia (“**Cboe**”) provides a high performance, low latency trading system. The information processed by the Cboe trading system is made available to market participants and data vendors through this Cboe Market Data Feed (“**Cboe MD Feed**”).

This service provides clients with details concerning orders and trade information on a real time basis.

Cboe Market Data Feed are available in ASCII/Binary versions. This document describes the Binary version. Technical aspect of this data feed including the connection protocol, message types and message structures etc are described in this document.

The Binary version use binary representation for numbers such as order reference in Market Data Messages. This representation provides more compact messages than the ASCII version. Also, the time precision is up to nanosecond while the ASCII version provides up to millisecond only.

This document describes the technical specification for this data feed including the connection protocol, message types and message structures etc.

This specification should be read in conjunction with the *Order Type Overview*.

2 Data Types

This chapter described the available data types that are used in the Cboe MD Binary Feed.

2.1 Numeric

Numeric fields consist of digits which are ASCII coded. They are presented in right justification and are space-filled from the left.

2.2 Alphanumeric

Alphanumeric text fields consist of alphabetical letters or digits (or both). They are presented in left justification and are padded with spaces to the right. Data fields of alphanumeric data type include Stock (symbol).

2.3 Prices

Price data fields are unsigned 8-byte big-endian binary encoded integer. After decoded, the last 7 digits are the decimal places and the remaining parts are digits. The maximum value of this type is 922,337,203,685.4775807 (0x7fffffffffffff)

2.4 Integer

Integer fields are unsigned big-endian (network byte order) binary encoded numbers. These fields are either 2 bytes, 4 bytes or 8 bytes. The maximum value of 2-byte integer is 32,767 (0x7fff), the maximum value of 4-byte integer is 2,147,483,647 (0x7fffffff), and the maximum value of 8-byte integer is 9,223,372,036,854,775,807 (0x7fffffffffffff).

2.5 UTCTimestamp

String fields representing date and time combination represented in UTC in the YYYYMMDDHHMMSSsss format. Valid values: YYYY = 0000-9999, MM = 01-12, DD = 01-31, HH = 00-23, MM = 00-59, SS = 00-60 (60 only if UTC leap second), sss=000-999 (indicating milliseconds).

2.6 LocalTimestamp

String fields representing date and time combination represented in Local Time in the YYYYMMDDHHMMSSsss format. Valid values: YYYY = 0000-9999, MM = 01-12, DD = 01-31, HH = 00-23, MM = 00-59, SS = 00-60 (60 only if UTC leap second), sss=000-999 (indicating milliseconds).

3 Session

3.1 Session Protocol

Cboe MD Binary Feed is built on a session layer on top of TCP/IP sockets. Sessions include sequenced and non-sequenced messages in which sequenced messages are the actual market data, while the non-sequenced messages are the session level interfaces that are not part of the market data feed. Sequenced messages include buy and sell orders, order executions, order cancellation, etc. Login, logout and heartbeat messages are the examples of non-sequenced messages. Retrieving and recovering previous sequenced messages (actual market data feed) is possible.

3.2 Session Initialisation

A Cboe MD Binary Feed session is initialised when client establishes a TCP session and sends a login packet. If a login packet is not received within 30 seconds, the server will terminate the session. When the server receives the login packet, it responds with a login accepted packet and starts transferring sequenced data, or it rejects the login and terminates the session (if appropriate).

3.3 Sequential Messaging

Each message is not literally assigned with a sequence number. Since messages are transferred in sequence, clients should give the first sequenced message of the day the sequence number '1', and all subsequent sequenced messages should then be assigned the next sequence number.

3.4 Session Recovery

Recovering a session can be done by counting the number of sequenced messages which have already been received and providing the next expected sequence number of the message to be received when reconnecting to the server. The new session will start from the next expected sequenced message.

4 Session Message

4.1 Debug Message (to Client)

Debug Messages are used to provide information to assist developers with application development and troubleshooting. They are used during development processes only and should be discarded.

DEBUG MESSAGE				
NAME	OFFSET	LENGTH	VALUE	REMARKS
Message Length	0	2	Integer	Message Length excluded this field
Message Type	2	1	“+”	Debug Message
Text	3	Variable	Alphanumeric	Free form text

4.2 Login Request (to Cboe)

A Login Request Message is sent to the server immediately after the client tries to establish a connection to the server. It also allows session recovery by providing the sequence number when sending the Login Request Message.

Since data is sent in ASCII, it must be padded with spaces; for example, the field lengths of Username and Sequence are 6 and 10 alphanumeric characters respectively, if Username is “JOHN”, it should be sent as “JOHN_ _”, and if the expected sequence number is 1, it should be sent as “_ _ _ _ _ _ _ _ _ _1” (“_” represents a space).

LOGIN REQUEST MESSAGE				
NAME	OFFSET	LENGTH	VALUE	REMARKS
Message Length	0	2	Integer	Message Length excluded this field
Message Type	2	1	“L”	Login Request Message
Username	3	6	Alphanumeric	Username
Password	9	10	Alphanumeric	Password
Session	19	10	Alphanumeric	Login requested session ID. Leave this field blank for initial login; and provide Session ID for subsequent logins.
Sequence	29	10	Numeric	The next expected sequence number of the feed from which to start. “1” indicates starting from the beginning of the day. “0” indicates the last message generated by the system bypassing recovery.

4.3 Login Accepted (to Client)

Login Accepted Message is used for acknowledging a login request message sent by client upon successful login.

LOGIN ACCEPTED MESSAGE				
NAME	OFFSET	LENGTH	VALUE	REMARKS
Message Length	0	2	Integer	Message Length excluded this field
Message Type	2	1	"A"	Login Accepted Message
Session	3	10	Alphanumeric	The session ID currently logged into.
Sequence	13	10	Numeric	The next expected sequence number.
Comma	23	1	","	Separator
Messages Total	24	10	Numeric	This is the total number of messages that have gone through the data feed. This is different from the sequence number which is the next sequence number that the client will receive upon connection which is in accordance with the sequence the client submitted in the Login Request message

4.4 Login Rejected (to Client)

Login Rejected Message is used for acknowledging the failure of a login request packet sent by client.

LOGIN REJECTED MESSAGE				
NAME	OFFSET	LENGTH	VALUE	REMARKS
Message Length	0	2	Integer	Message Length excluded this field
Message Type	2	1	"J"	Login Rejected Message
Reject Reason	3	1	"A" or "S"	Reason of the login rejection: "A" – Invalid username/password "S" – Invalid session ID

4.5 Logout Request (to Cboe)

Logout Request Message is used for sending a session termination request to the server. The session will be closed immediately upon receipt of this message.

LOGOUT REQUEST MESSAGE				
NAME	OFFSET	LENGTH	VALUE	REMARKS
Message Length	0	2	Integer	Message Length excluded this field
Message Type	2	1	"O"	Logout Request Message

4.6 Server Heartbeat Message (to Client)

If a session is left idle for more than one second, the server will send a heartbeat message.

SERVER HEARTBEAT MESSAGE				
NAME	OFFSET	LENGTH	VALUE	REMARKS
Message Length	0	2	Integer	Message Length excluded this field
Message Type	2	1	"H"	Server Heartbeat Message

4.7 Client Heartbeat Message (to Cboe)

A Client Heartbeat Message must be sent to the server from the client side on a regular interval. The server assumes the client is no longer active if it does not receive a heartbeat message from the client for more than 15 seconds, in which case the session will be terminated.

CLIENT HEARTBEAT MESSAGE				
NAME	OFFSET	LENGTH	VALUE	REMARKS
Message Length	0	2	Integer	Message Length excluded this field
Message Type	2	1	"R"	Client Heartbeat Message

4.8 Sequenced Data Message (to Client)

The Sequenced Data Message contains the actual market data. Since messages are transferred in sequence, client should give the first sequenced data message of the current session the sequence number '1', and thereafter give each subsequent sequenced message the next sequence number. With the sequence number correctly assigned by the client to each message, session recovery is possible.

SEQUENCED DATA MESSAGE				
NAME	OFFSET	LENGTH	VALUE	REMARKS
Message Length	0	2	Integer	Message Length excluded this field
Message Type	2	1	"S"	Sequenced Data Message
Data	3	Variable	Market Data Message	Sequenced data. Contains all messages of actual market data feed.

5 Market Data Feed Messages

The Cboe MD Binary Feed contains a series of messages informing clients of the orders added to and removed from the Cboe book and the execution of trades on Cboe's market. Market Data messages are included in Sequenced Data Messages and are inbound messages to the client side.

5.1 Second Message

Second Message will be sent for every second for which there is at least one payload.

SECOND MESSAGE				
NAME	OFFSET	LENGTH	VALUE	REMARKS
Time - second	0	4	Integer	The number of seconds since mid-night
Message Type	4	1	"T"	Second Message

5.2 System Event Message

The System Event Message is used for signalling an event which affects the Cboe system.

SYSTEM EVENT MESSAGE				
NAME	OFFSET	LENGTH	VALUE	REMARKS
Time - nanosecond	0	4	Integer	The number of nanoseconds since last Second Message Time Format: nnnnnn000
Message Type	4	1	"S"	System Event Message
Event Code	5	1	Alphanumeric	Please see System Event Codes below
Market ID	6	4	Alphanumeric	Right-padded with spaces. If no market ID available (which means the Event Code applies to the whole system), then filled with space.

5.2.1 Market IDs

MARKET ID	DESCRIPTION	REMARKS
AUS	Australia Stock Market	Chi-X Continuous On-Market Trading
CXAW	Chi-X Australia - Warrants	Chi-X Warrants Trading
CXAE	Chi-X Australia - ETF	Chi-X ETF Trading
CXAR	Chi-X Australia - TraCR	Chi-X TraCR Trading
CXAQ	Chi-X Australia – QMF	Chi-X QMF Trading

5.2.2 System Event Codes

SYSTEM EVENT CODE	DESCRIPTION	REMARKS
O	Start of Messages	This is the first message of the day.
S	Chi-X Open	This message indicates that Chi-X is open for on-market continuous trading and accepting orders. Before the Chi-X Open message you may receive Off-Exchange Trade messages. Market ID field value is also provided in the event

SYSTEM EVENT CODE	DESCRIPTION	REMARKS
		message which indicates which market this event belongs to.
E	Chi-X Close	<p>This message indicates that Chi-X's continuous trading session is closed. Chi-X will not accept any more orders, except Market on Close ("MOC") orders, for the continuous trading session. Clients may still receive a Trade Message for MOC executions, Broken Trade, Order Cancel and Off-Exchange Trade messages after this session state.</p> <p>Market ID field value is also provided in the event message which indicates which market this event belongs to.</p>
M	Chi-X MOC Close	<p>This message indicates that MOC orders can no longer execute. Clients may still receive MOC Executions after this session state closes.</p> <p>Market ID field value is also provided in the event message which indicates which market this event belongs to.</p>
H	Chi-X Halt	<p>This message indicates that Chi-X is halted. Chi-X will not accept any order or Off-exchange trade report during this period. Clients may still receive Broken Trade and Order Cancel messages during this period.</p> <p>Market ID field value is also provided in the event message which indicates which market this event belongs to.</p>
R	Chi-X Resume	<p>This message indicates that Chi-X is resumed from halted state and accepting orders and Off-Exchange Trade Reports.</p> <p>Market ID field value is also provided in the event message which indicates which market this event belongs to.</p>
C	End of Messages	This is the last message of the day.
Z	Reset Orderbook	This message indicates that Chi-X has explicitly reset its order book for all securities.
N	No Operation	This message is a system reserved message. Recipient should ignore this message, but increase the next expected sequence.

5.3 Add Order Message

Add Order Message is used for acknowledging the acceptance of a visible order into the Cboe book. The message contains an Order Reference which is a unique key of the day assigned to the order by Cboe.

Add Order Message may be sent for accepting a revised order after the original order is cancelled. Please refer to *Section 5.5 Modification of Existing Orders* for detail.

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ADD ORDER MESSAGE				
NAME	OFFSET	LENGTH	VALUE	REMARKS
Time - nanosecond	0	4	Integer	The number of nanoseconds since last Second Message Time Format: nnnnnn000
Message Type	4	1	"A"	Add Order Message
Order Reference	5	4	Integer	Unique order reference number of the day.
Buy/Sell Indicator	9	1	"B" or "S"	"B" = Buy Order "S" = Sell Order
Shares	10	4	Integer	Total number of shares being added to the book. For undisclosed order, number of shares is zero. (The number of shares added to the book may be less than the actual number of shares entered because part of the order may trade before being posted to the book).
Stock	14	6	Alphanumeric	Stock symbol (which is right-padded with spaces).
Price	20	8	Price	The displayprice of the order.
Display	28	1	"Y"	"Y" = displayed in quote
Order Source	29	1	"C"	"C" = Visible Limit order

ADD ORDER MESSAGE (ATTRIBUTED MARKET)				
NAME	OFFSET	LENGTH	VALUE	REMARKS
Time - nanosecond	0	4	Integer	The number of nanoseconds since last Second Message Time Format: nnnnnn000
Message Type	4	1	"F"	Add Order Message
Order Reference	5	4	Integer	Unique order reference number of the day.
Buy/Sell Indicator	9	1	"B" or "S"	"B" = Buy Order "S" = Sell Order
Shares	10	4	Integer	Total number of shares being added to the book. For undisclosed order, number of shares is zero. (The number of shares added to the book may be less than the actual number of shares entered because part of the order may trade before being posted to the book).
Stock	14	6	Alphanumeric	Stock symbol (which is right-padded with spaces).
Price	20	8	Price	The displayprice of the order.
Display	28	1	"Y"	"Y" = displayed in quote
Order Source	29	1	"C"	"C" = Visible Limit order
PID	30	5	Alphanumeric	Participant ID (which is right-padded with spaces)

5.4 Order Execution Message

When a visible order on the book is executed, either in whole or in part, an Order Execution Message is sent.

Please note that this behaviour also occurs when the visible portion of an iceberg order is executed.

ORDER EXECUTION MESSAGE				
NAME	OFFSET	LENGTH	VALUE	REMARKS
Time - nanosecond	0	4	Integer	The number of nanoseconds since last Second Message Time Format: nnnnnn000
Message Type	4	1	"E"	Order Execution Message
Order Reference	5	4	Integer	The unique order reference number of the order which was executed.
Executed Shares	9	4	Integer	The number of shares executed on the trade.
Trade Reference	13	4	Integer	The unique trade reference number of the day.
Contra Order Reference	17	4	Integer	The unique order reference number of the contra order that matched with this order.
Order Source	21	1	"C"	"C" = Visible Limit Order

ORDER EXECUTION MESSAGE (ATTRIBUTED MARKET)				
NAME	OFFSET	LENGTH	VALUE	REMARKS
Time - nanosecond	0	4	Integer	The number of nanoseconds since last Second Message Time Format: nnnnnn000
Message Type	4	1	"G"	Order Execution Message
Order Reference	5	4	Integer	The unique order reference number of the order which was executed.
Executed Shares	9	4	Integer	The number of shares executed on the trade.
Trade Reference	13	4	Integer	The unique trade reference number of the day.
Contra Order Reference	17	4	Integer	The unique order reference number of the contra order that matched with this order.
Order Source	21	1	"C"	"C" = Visible Limit Order
Contra PID	22	5	Alphanumeric	Contra Participant PID (which is right-padded with spaces)

5.5 Order Cancel Message

When an order on the book is cancelled completely, the quantity of an order is reduced or the price of a pegged order is revised, an Order Cancel Message is sent out.

ORDER CANCEL MESSAGE				
NAME	OFFSET	LENGTH	VALUE	REMARKS
Time - nanosecond	0	4	Integer	The number of nanoseconds since last Second Message Time Format: nnnnnn000
Message Type	4	1	"X"	Order Cancel Message
Order Reference	5	4	Integer	The unique order reference number of the order which was cancelled. (Order Reference can be a reference of a previously sent Add Order Message.)
Cancelled Shares	9	4	Integer	Number of shares cancelled. For cancel undisclosed order, number of shares is always zero.

5.6 Modification of Existing Orders

5.6.1 Modification of Price

When the price on an existing order is modified, a Cancel Message for full quantity of the open order is sent out, followed by an Add Order Message which is assigned with the same Order Reference as the cancelled order.

5.6.2 Reduction of quantity

When there is a reduction of quantity on an existing order, a Cancel Message for the existing order is sent out which acknowledges the reduction of the number of shares pending in the referenced open order. If the number of currently pending shares for an order reaches zero, the order will be removed from the book.

5.7 Trade Message

When a trade occurs against order quantity not visible on the book (ie. a fully hidden Price Improvement order, the hidden portion of an iceberg order or an undisclosed order) or against a hidden MOC order, a Trade Message is sent out. Trade Messages fill in the gaps left when an order that is not visible on the book is executed.

Note: Order Execution Messages and Trade Messages together provide a complete picture of all executions that occur on Cboe. A Trade Message does not affect the book and can be ignored for book-building but can be used for time and sales and other execution based data aggregation.

Order Reference and Contra Order Reference are always set to 0 (zero) and the Buy/Sell Indicator to 'B'. This applies to the Long Form version as well.

TRADE MESSAGE				
NAME	OFFSET	LENGTH	VALUE	REMARKS
Time - nanosecond	0	4	Integer	The number of nanoseconds since last Second Message Time Format: nnnnnn000
Message Type	4	1	"P"	Trade Message resulting from hidden liquidity

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TRADE MESSAGE				
NAME	OFFSET	LENGTH	VALUE	REMARKS
Order Reference	5	4	Integer	The order reference number will always be set to 0
Buy/Sell Indicator	9	1	"B" or "S"	The indicator value is always set to B
Shares	10	4	Integer	Number of shares executed.
Stock	14	6	Alphanumeric	Stock symbol (right-padded with spaces)
Price	20	8	Price	Match price of the order
Trade Reference	28	4	Integer	Trade reference number generated for the trade.
Contra Order Reference	32	4	Integer	The contra order reference number will always be set to 0.
Trade Type	36	1	Alphanumeric	"B" = Broker Preferred Trade "N" = Trade resulting from normal matching logic
Trade Designation	37	1	Alphanumeric	"C" = CXAC (Limit) "P" = CXAP (Mid-Point) "N" = CXAN (Near Point) "F" = CXAF (Far Point) "M" = CXAM (MOC)

TRADE MESSAGE (ATTRIBUTED MARKET)				
NAME	OFFSET	LENGTH	VALUE	REMARKS
Time - nanosecond	0	4	Integer	The number of nanoseconds since last Second Message Time Format: nnnnnn000
Message Type	4	1	"J"	Trade Message resulting from hidden liquidity
Order Reference	5	4	Integer	The order reference number will always be set to 0
Buy/Sell Indicator	9	1	"B" or "S"	The indicator value is always set to B
Shares	10	4	Integer	Number of shares executed.
Stock	14	6	Alphanumeric	Stock symbol (right-padded with spaces)
Price	20	8	Price	Match price of the order
Trade Reference	28	4	Integer	Trade reference number generated for the trade.
Contra Order Reference	32	4	Integer	The contra order reference number will always be set to 0.
Trade Type	36	1	Alphanumeric	"B" = Broker Preferred Trade "N" = Trade resulting from normal matching logic
Trade Designation	37	1	Alphanumeric	"C" = CXAC (Limit) "P" = CXAP (Mid-Point) "N" = CXAN (Near Point) "F" = CXAF (Far Point) "M" = CXAM (MOC)
PID	38	5	Alphanumeric	Participant ID (which is right-padded with spaces)
Contra PID	43	5	Alphanumeric	Contra Participant ID (which is right-padded with spaces)

5.8 Broken Trade Message

When an execution is broken on Cboe, a Broken Trade Message is sent out. If a trade is broken, it cannot be reinstated.

Note: A Broken Trade Message only affects applications which build on a time-and-sales database or maintain cumulative volumes or high/low calculations. A Broken Trade Message has no effect on the book and it can be ignored for book-building.

BROKEN TRADE MESSAGE				
NAME	OFFSET	LENGTH	VALUE	REMARKS
Time - nanosecond	0	4	Integer	The number of nanoseconds since last Second Message Time Format: nnnnnn000
Message Type	4	1	"B"	Broken Trade Message
Trade Reference	5	4	Integer	The trade reference number of the execution that was broken. (The Trade Reference is from a previously sent Order Execution Message or Trade Message.)

5.9 Off-Exchange Trade Message

Off-Exchange Trade Message is sent once participants report an off-exchange trade to Cboe.

OFF-EXCHANGE TRADE MESSAGE				
NAME	OFFSET	LENGTH	VALUE	REMARKS
Time - nanosecond	0	4	Integer	The number of nanoseconds since last Second Message Time Format: nnnnnn000
Message Type	4	1	"Q"	Off-Exchange Trade Message
Shares	5	4	Integer	Number of shares traded.
Stock	9	6	Alphanumeric	Stock symbol (right-padded with spaces)
Price	15	8	Price	Reported price of the trade
Trade Reference	23	4	Integer	Trade reference number generated for the trade.
Trade Report Type	27	1	Alphanumeric	Trade report type of the Off-Exchange Trade message. Valid values: "B" – Block Trade "P" – Large Portfolio Trade "T" – Large Principal Transaction "S" – Trades With Price Improvement "L" – Permitted Trade During Post Trading Hours Period "M" – Permitted Trade During Pre Trading Hours Period "E" – Out Of Hours Trade "F" – ETF Trade Report for unit creations or redemptions
Transaction Time	28	17	UTCTimestamp	The date and time of the Off-Exchange Trade as specified in the Trade Report submitted by the trading participant

OFF-EXCHANGE TRADE MESSAGE (ATTRIBUTED MARKET)				
NAME	OFFSET	LENGTH	VALUE	REMARKS
Time - nanosecond	0	4	Integer	The number of nanoseconds since last Second Message Time Format: nnnnnn000
Message Type	4	1	"K"	Off-Exchange Trade Message
Shares	5	4	Integer	Number of shares traded.
Stock	9	6	Alphanumeric	Stock symbol (right-padded with spaces)
Price	15	8	Price	Reported price of the trade
Trade Reference	23	4	Integer	Trade reference number generated for the trade.
Trade Report Type	27	1	Alphanumeric	Trade report type of the Off-Exchange Trade message. Valid values: "B" – Block Trade "P" – Large Portfolio Trade "T" – Large Principal Transaction "S" – Trades With Price Improvement "L" – Permitted Trade During Post Trading Hours Period "M" – Permitted Trade During Pre Trading Hours Period "E" – Out Of Hours Trade "F" – ETF Trade Reports for unit creations or redemptions
Transaction Time	28	17	UTCimestamp	The date and time of the Off-Exchange Trade as specified in the Trade Report submitted by the trading participant
PID	45	5	Alphanumeric	Participant ID (which is right-padded with spaces)
Contra PID	50	5	Alphanumeric	Contra Participant ID (which is right-padded with spaces)

5.10 Broken Off-Exchange Trade Message

When an off-exchange trade is broken on Cboe, a Broken Off-Exchange Trade Message is sent out. If a trade is broken, it cannot be reinstated.

BROKEN OFF-EXCHANGE TRADE MESSAGE				
NAME	OFFSET	LENGTH	VALUE	REMARKS
Time - nanosecond	0	4	Integer	The number of nanoseconds since last Second Message Time Format: nnnnnn000
Message Type	4	1	"C"	Broken Off-Exchange Trade Message
Trade Reference	5	4	Integer	The trade reference number of the off-exchange trade that was broken. (The Trade Reference is from a previously sent Off-Exchange Trade Message.)

5.11 Stock Status Message

This message indicates the current trading status of a stock. At the start of day, the feed will send out a stock status message for each of the symbols trading on Cboe. Subsequently, stock status messages will be sent when a stock status changes or is released for trading.

STOCK STATUS MESSAGE				
NAME	OFFSET	LENGTH	VALUE	REMARKS
Time - nanosecond	0	4	Integer	The number of nanoseconds since last Second Message Time Format: nnnnnn000
Message Type	4	1	"H"	Stock Trading Action Message
Stock	5	6	Alphanumeric	Stock Symbol
Security Status	11	1	Alphanumeric	"T" = Active "H" = Halted "S" = Suspend
Reserved	12	1	Alphanumeric	Reserved for future use

5.12 Calculated Value Message

Cboe calculated market values will be conveyed through this message. This message will be sent regularly for each symbol that has calculated market value available. The frequency of these updates will be determined in agreement with the Issuers.

CALCULATED VALUE MESSAGE				
NAME	OFFSET	LENGTH	VALUE	REMARKS
Time - nanosecond	0	4	Integer	The number of nanoseconds since last Second Message Time Format: nnnnnn000
Message Type	4	1	"Y"	Calculated Value Message
Symbol	5	6	Alphanumeric	Symbol of the Calculated Value
Value Category	11	1	Alphanumeric	Category of the data conveyed in the "Value" field 1 – Closing Price 2 – iNAV values (ETF) 3 – Index values 4 – FX values 5 – EOD NAV from Issuer
Value	12	8	Price	Calculated Value
Value Generation Time	20	17	LocalTimestamp	Indicates when the Calculated Value is generated

6 Sample Outputs

6.1 Second Message

ACTION	HEX	MEANING
Second Message	00 06 53 00 00 d3 36 54	Time(Second) : 54070 Message Type: T

6.2 Order Added and Fully Traded

ACTION	HEX	MEANING
Sell of 100 XXX shares entered at 85.89. Order Reference 638 assigned.	00 1f 53 02 55 e2 98 41 00 00 02 7e 42 00 00 00 64 58 58 58 20 20 20 00 00 00 00 33 31 c6 20 59 43	Time(Nanosecond) : 039183000 Message Type: A Order Reference: 638 Buy/Sell Indicator: B Shares: 100 Stock: XXX Price: 85.89 Display: Y Order source: C
Matching buy order entered and order traded with Reference "130000355".	00 17 53 02 c4 7b 18 45 00 00 02 7e 00 00 00 64 07 bf a5 e3 00 00 02 7f 43	Time(Nanosecond) : 046431000 Message Type: E Order Reference: 638 Executed Shares: 100 Trade Reference: 130000355 Contra Order Reference: 639 Order source: C

Note: There is no Add Order Message for the matching buy order because it does not display on the book.

Buyer needs to determine the execution price based on the limit price of the original order since the Order Execution Message has no price indicated.

6.3 Order Added, Fully Traded and Remaining Qty of Matching Order is Placed on Book

ACTION	HEX	MEANING
Buy order of 111 XXX shares entered at 85.89. Order Reference "21" assigned.	00 1f 53 1b 48 60 00 41 00 00 00 15 42 00 00 00 6f 58 58 58 20 20 20 00 00 00 00 33 31 c6 20 59 43	Time(Nanosecond) : 457728000 Message Type: A Order Reference: 21 Buy/Sell Indicator: B Shares: 111 Stock: XXX Price: 85.89 Display: Y Order source: C
Matching sell order entered for 112 shares of XXX. Order Execution Message is sent out with Order Reference "22" and Trade Reference "130000301".	00 17 53 1c 81 f5 58 45 00 00 00 15 00 00 00 6f 07 bf a5 ad 00 00 00 16 43	Time(Nanosecond) : 478279000 Message Type: E Order Reference: 21 Executed Shares: 111 Trade Reference: 130000301 Contra Order Reference: 22 Order source: C

Market Data Feed Specification (Binary Version)

ACTION	HEX	MEANING
Add the remaining share (1) of the sell order onto the book.	00 1f 53 1c 81 f5 58 41 00 00 00 16 53 00 00 01 58 58 58 20 20 20 00 00 00 33 31 c6 20 59 43	Time(Nanosecond) : 478279000 Message Type: A Order Reference: 22 Buy/Sell Indicator: S Shares: 1 Stock: XXX Price: 85.89 Display: Y Order source: C

6.4 Price Revision

ACTION	HEX	MEANING
Sell order of 1000 XXX shares entered. Order Reference "25" assigned. The display price is 85.88.	00 1f 53 27 46 2f 18 41 00 00 00 19 53 00 00 03 e8 58 58 58 20 20 20 00 00 00 33 30 3f 80 59 43	Time(Nanosecond) : 658911000 Message Type: A Order Reference: 25 Buy/Sell Indicator: S Shares: 1000 Stock: XXX Price: 85.88 Display: Y Order source: C
Price is revised to 85.89. An Order Cancel Message is sent out.	00 0e 53 2d 3c 2f 58 58 00 00 00 19 00 00 03 e8	Time(Nanosecond) : 758919000 Message Type: X Order Reference: 25 Shares: 1000
An Add Order Message is sent after the Order Cancel Message. The Order Reference is the same. The display price changes to 85.89.	00 1f 53 2d 3c 2f 58 41 00 00 00 19 53 00 00 03 e8 58 58 58 20 20 20 00 00 00 33 31 c6 20 59 43	Time(Nanosecond) : 758919000 Message Type: A Order Reference: 25 Buy/Sell Indicator: S Shares: 1000 Stock: XXX Price: 85.89 Display: Y Order source: C

6.5 Reduction of Order Quantity

ACTION	HEX	MEANING
Sell order of 1000 XXX shares entered. Order Reference "26" assigned. The display price is 85.88.	00 1f 53 33 35 ae 20 41 00 00 00 1a 53 00 00 03 e8 58 58 58 20 20 20 00 00 00 33 30 3f 80 59 43	Time(Nanosecond) : 859156000 Message Type: A Order Reference: 26 Buy/Sell Indicator: S Shares: 1000 Stock: XXX Price: 85.88 Display: Y Order source: C
The order quantity is cut down by 100 shares. An Order Cancel Message is sent informing client about the change.	00 0e 53 39 2f 21 30 58 00 00 00 1a 00 00 00 64	Time(Nanosecond) : 959390000 Message Type: X Order Reference: 26 Shares: 100

Note: Cboe currently does not support increase of total order quantity so clients should calculate the remaining amount of the original order which is still open.

6.6 Order Revised and Executed

ACTION	HEX	MEANING
A visible sell order of 1666 XXX shares is placed on the book with the displayprice of 85.89.	00 1f 53 23 06 10 80 41 00 00 00 17 53 00 00 06 82 58 58 58 20 20 20 00 00 00 00 33 31 c6 20 59 43	Time(Nanosecond) : 587600000 Message Type: A Order Reference: 23 Buy/Sell Indicator: S Shares: 1666 Stock: XXX Price: 85.89 Display: Y Order source: C
A visible buy order of 1066 XXX shares is placed on the book with the displayprice of 85.88.	00 1f 53 23 60 d6 c8 41 00 00 00 18 42 00 00 04 2a 58 58 58 20 20 20 00 00 00 00 33 30 3f 80 59 43	Time(Nanosecond) : 593549000 Message Type: A Order Reference: 24 Buy/Sell Indicator: B Shares: 1066 Stock: XXX Price: 85.88 Display: Y Order source: C
The buy order is revised to the displayprice of 85.89. An Order Cancel Message is sent out.	00 0e 53 23 c1 59 d0 58 00 00 00 18 00 00 04 2a	Time(Nanosecond) : 599874000 Message Type: X Order Reference: 24 Shares: 1066
The trade is executed. An Order Execution Message is sent out.	00 17 53 23 c1 59 d0 45 00 00 00 17 00 00 04 2a 07 bf a5 ae 00 00 00 18 43	Time(Nanosecond) : 599874000 Message Type: E Order Reference: 23 Executed Shares: 1066 Trade Reference: 130000302 Contra Order Reference: 24 Order source: C

6.7 Execution of Fully Hidden Order

ACTION	HEX	MEANING
A hidden sell order of 777 XXX shares is placed on the book with the displayprice of 85.89.	[No message sent for hidden order.]	
A visible buy order of 1000 shares is entered at 85.89. A Trade Message is sent out corresponding to the hidden order quantity. MIC Venue is Near Point	00 27 53 03 e0 01 20 50 00 00 00 00 42 00 00 03 09 58 58 58 20 20 20 00 00 00 00 33 31 c6 20 07 bf a5 af 00 00 00 00 4e 4e	Time(Nanosecond) : 065012000 Message Type: P Order Reference: 0 Buy/Sell Indicator: B Shares: 777 Stock: XXX Price:85.89 Trade Reference: 130000303 Contra Order Reference: 0 Trade Type: N Trade Resignation: N
The remaining quantity of the buy order is added to the book.	00 1f 53 03 e0 01 20 41 00 00 00 1c 42 00 00 00 df 58 58 58 20 20 20 00 00 00 00 33 31 c6 20 59 43	Time(Nanosecond) : 065012000 Message Type: A Order Reference: 28 Buy/Sell Indicator: B Shares: 223 Stock: XXX Price: 85.89 Display: Y Order source: C

6.8 Trades against Partially Hidden Order (Iceberg)

ACTION	HEX	MEANING
<p>A sell order of 10000 XXX shares is placed on the book with a visible quantity of 1000 shares. The displayprice is 85.89. An Add Order Message is sent out for the visible amount.</p>	<pre>00 1f 53 04 a0 3c 10 41 00 00 00 1d 53 00 00 03 e8 58 58 58 20 20 20 00 00 00 00 33 31 c6 20 59 43</pre>	<pre>Time(Nanosecond) : 077610000 Message Type: A Order Reference: 29 Buy/Sell Indicator: S Shares: 1000 Stock: XXX Price: 85.89 Display: Y Order source: C</pre>
<p>A buy order of 500 shares is entered and crosses against the visible quantity of 1000 shares. 500 shares remain on the book.</p>	<pre>00 17 53 05 65 22 50 45 00 00 00 1d 00 00 01 f4 07 bf a5 b0 00 00 00 1e 43</pre>	<pre>Time(Nanosecond) : 090514000 Message Type: E Order Reference: 29 Executed Shares: 500 Trade Reference: 130000304 Contra Order Reference: 30 Order source: C</pre>
<p>A buy order for 4000 shares is entered and crosses against the iceberg. An Order Execution Message for the visible trade of 500 shares is sent out.</p>	<pre>00 17 53 05 df 15 10 45 00 00 00 1d 00 00 01 f4 07 bf a5 b1 00 00 00 1f 43</pre>	<pre>Time(Nanosecond) : 098506000 Message Type: E Order Reference: 29 Executed Shares: 500 Trade Reference: 130000305 Contra Order Reference: 31 Order source: C</pre>
<p>A Trade Message is sent out for the hidden quantity of 3500 shares.</p>	<pre>00 27 53 05 df 15 10 50 00 00 00 00 42 00 00 0d ac 58 58 58 20 20 20 00 00 00 00 33 31 c6 20 07 bf a5 b1 00 00 00 00 4e 43</pre>	<pre>Time(Nanosecond) : 098506000 Message Type: P Order Reference: 0 Buy/Sell Indicator: B Shares: 3500 Stock: XXX Price: 85.89 Trade Reference: 130000305 Contra Order Reference: 0 Trade Type: N Trade Resignation: C</pre>
<p>The peak is refreshed onto the book. An Add Order Message is sent out for 1000 shares.</p>	<pre>00 1f 53 05 df 15 10 41 00 00 00 20 53 00 00 03 e8 58 58 58 20 20 20 00 00 00 00 33 31 c6 20 59 43</pre>	<pre>Time(Nanosecond) : 098506000 Message Type: A Order Reference: 32 Buy/Sell Indicator: S Shares: 1000 Stock: XXX Price: 85.89 Display: Y Order source: C</pre>

6.9 Trade Cancellation (Bust)

ACTION	HEX	MEANING
A sell order of 111 XXX shares is placed on the book. The displayprice is 85.89. An Add Order Message is sent out for the visible amount.	00 1f 53 06 75 bf 60 41 00 00 00 21 42 00 00 00 6f 58 58 58 20 20 20 00 00 00 00 33 31 c6 20 59 43	Time(Nanosecond) : 108380000 Message Type: A Order Reference: 33 Buy/Sell Indicator: B Shares: 111 Stock: XXX Price: 85.89 Display: Y Order source: C
An Order Execution Message is sent out on receiving a matching order. The Trade Reference is "130000306".	00 17 53 07 02 e4 30 45 00 00 00 21 00 00 00 6f 07 bf a5 b2 00 00 00 22 43	Time(Nanosecond) : 117630000 Message Type: E Order Reference: 33 Executed Shares: 111 Trade Reference: 130000306 Contra Order Reference: 34 Order source: C
When the trade is cancelled by Chi-X, a Broken Trade Message is sent.	00 0a 53 25 86 95 28 42 07 bf a5 b2	Time(Nanosecond) : 629577000 Message Type: B Trade Reference: 130000306

6.10 Undisclosed Order Added, Partially Traded, and then Fully Traded

ACTION	HEX	MEANING
An undisclosed buyorder of 10000 XXX shares entered at 10.00. 0 share is displayed in the Add Order Message. Order Reference 8 assigned.	00 1f 53 0f a6 7c 28 41 00 00 00 28 42 00 00 00 00 58 58 58 20 20 20 00 00 00 00 05 f5 e1 00 59 43	Time(Nanosecond) : 262569000 Message Type: A Order Reference: 40 Buy/Sell Indicator: B Shares: 0 Stock: XXX Price: 10.00 Display: Y Order source: C
A visible sell order of 5000 XXX shares is entered at 10.00. A Trade Message is sent out for the traded quantity of 5,000 shares.	00 27 53 10 10 23 08 50 00 00 00 00 42 00 00 13 88 58 58 58 20 20 20 00 00 00 00 05 f5 e1 00 07 bf a5 b5 00 00 00 00 4e 43	Time(Nanosecond) : 269493000 Message Type: P Order Reference: 0 Buy/Sell Indicator: B Shares: 5000 Stock: XXX Price: 10.00 Trade Reference: 130000309 Contra Order Reference: 0 Trade Type: N Trade Resignation: C
Another visible sell order of 5000 XXX shares is entered at 10.00. A Trade Message is sent out for the traded quantity of 5000 shares.	00 27 53 10 a8 77 20 50 00 00 00 00 42 00 00 13 88 58 58 58 20 20 20 00 00 00 00 05 f5 e1 00 07 bf a5 b6 00 00 00 00 4e 43	Time(Nanosecond) : 279476000 Message Type: P Order Reference: 0 Buy/Sell Indicator: B Shares: 5000 Stock: XXX Price: 10.00 Trade Reference: 130000310 Contra Order Reference: 0 Trade Type: N Trade Resignation: C
The undisclosed order is then cancelled by Chi-X and an Order Cancel Message with 0 shares is sent out	00 0e 53 10 a8 77 20 58 00 00 00 28 00 00 00 00	Time(Nanosecond) : 279476000 Message Type: X Order Reference: 40 Shares: 0

6.11 Execution of Market On Close Order

ACTION	HEX	MEANING
A Trade Message is sent out for MOC trade with quantity of 3500 shares and price of 85.89.	00 27 53 0d 4e c0 e8 50 00 00 00 00 42 00 00 0d ac 58 58 58 20 20 20 00 00 00 00 33 31 c6 20 07 bf a5 b7 00 00 00 00 4e 4d	Time(Nanosecond) : 223265000 Message Type: P Order Reference: 0 Buy/Sell Indicator: B Shares: 3500 Stock: XXX Price: 85.89 Trade Reference: 130000311 Contra Order Reference: 0 Trade Type: N Trade Resignation: M

6.12 Execution of Broker Preferred Order

ACTION	HEX	MEANING
A broker preferred sell order (hidden) of 1000 shares in XXX is placed on the book with a price of 85.89.	[No message sent for hidden order.]	
A broker preferred buy order (hidden) of 3500 shares is entered at 85.89. A Trade Message is sent out for broker preferred trade with quantity of 1000 shares and price of 85.89. MIC Venue is Far Point.	00 27 53 11 6b 51 f0 50 00 00 00 00 42 00 00 03 e8 58 58 58 20 20 20 00 00 00 00 33 31 c6 20 07 bf a5 b9 00 00 00 00 42 46	Time(Nanosecond) : 292246000 Message Type: P Order Reference: 0 Buy/Sell Indicator: B Shares: 1000 Stock: XXX Price: 85.89 Trade Reference: 130000313 Contra Order Reference: 0 Trade Type: B Trade Resignation: F
The remaining quantity of the buy order is added to the book.	[No message sent for hidden order.]	